DOCUMENT RESUME

ED 436 167 IR 019 792

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TITLE Research on Technology Courses at Colleges of Education.
PUB DATE 1999-02-00
NOTE 7p.; In: Proceedings of Selected Research and Development Papers Presented at the National Convention of the Association for Educational Communications and Technology [AECT] (21st, Houston, TX, February 10-14, 1999); see IR 019 753.
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Uses in Education; *Course Content; Course Descriptions; *Educational Technology; Higher Education; School Surveys; *Schools of Education; *Teacher Education
IDENTIFIERS Web Sites

ABSTRACT

This study investigated the structure and content of technology courses at 25 colleges of education. Data were collected through interviews at two professional conventions, followed up by e-mail communication. Course syllabi were collected via e-mail and downloaded from the Internet. Two main types of teaching structures were found at the universities. The similarity of the two structures was that both consisted of lecture and lab; in the lecture, students learned computer concepts, and they conducted hand-on activities in the lab. The difference was in where the lectures was conducted, e.g., in a large lecture hall or in a computer lab where the instructors taught both concepts and skills. At all universities, the course content contained concepts and skills. Primary components included word processing, spreadsheet, database, multimedia, presentation, telecommunications, and World Wide Web page development. Web sites containing syllabi for several of the universities are listed. (MES)

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IR 019792

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RESEARCH ON TECHNOLOGY COURSES AT COLLEGES OF EDUCATION

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Teachers of the 21st century must know technology. The number of colleges of education that offer technology courses is drastically increasing. Preservice and inservice teachers are hoped to use technology in their classrooms. In order to provide them with the best instruction on technology use, it is important to explore the technology courses at colleges of education. The purpose of the study is to investigate the one course that is often called "The Technology Course." Structures and contents of the course at twenty-five colleges of education are examined.

Overview

Since 1980, we have been experiencing a rapid change in our society due to the advance of technology. Technology is influencing our education, schools, and training of teachers who will be teaching in the classrooms of the 21st century.

The business world demands schools to prepare the students for effective use of technology in their future work places. The president and vice president of the United States have publicly addressed that every child in the nation should feel comfortable on the Information Super-Highway. Moreover, the increasing number of computers at schools clearly speaks for the trend. In the past ten years, more than 300,000 computers have been added (Northrup and Little, 1996). According to a report released by the National Council for Accreditation of Teacher Education (1997), computer-to-student ratios have dropped consistently from 1:50 in 1985 to 1:20 in 1990 to an estimated 1:9 in 1997.

All these facts indicate that new technology is affecting our classroom practice and the culture of the schools. The technological influence is challenging our teachers and will challenge the two million new teachers who will be hired over the next decade. Teachers should feel comfortable with the new culture of the schools and be ready to teach in the "Information Age." Do teacher education programs prepare their students to face the challenges? Unfortunately, the answer is no; most programs "have a long way to go" (NCATE, 1997, p. 1).

To answer the urgent need, the NCATE task force is assisting colleges of education to help their students take advantage of technology for instruction: new understandings, new approaches, new roles, and new attitudes (NCATE, 1997). The teachers need to understand the deep impact of technology on the nature of work, on communication, and on the development of knowledge. They must use a wide range of technological tools and software as part of their own instruction. They must help students in the use of technology to gain information that goes beyond textbooks and teachers. In addition, they should be fearless in the use of technology and be life-long learners.

In response to the call, colleges of education across the nation become equipped with new technological tools. Many programs are offering technology courses to help their students to take advantage of these tools and to utilize them for enhanced learning. However, there has been little discussion on what skills and knowledge students must have to take advantage of the technological tools (Old Dominion University, 1998). There is a need to investigate the courses offered in the colleges.

The following research focused on the one course that is often called "The Technology Course." It is a computer course commonly offered at colleges of education. The study investigated how the course was taught and what was instructed in the course at different colleges of education.

Procedures and Methods

A pilot study was first conducted involving nine universities: Arizona State University, Florida State University, Harvard University, Indiana University, Massachusetts Institute of Technology, Pennsylvania State University, Stanford University, University of Virginia, and Yale University. They were selected because they were either considered to be prestigious universities or had good reputation of offering outstanding educational technology programs.

First, phone calls were made to the college of education of the universities to find a course that was preparing undergraduate education students on using technology for their future teaching career. During the same time, an Internet search was conducted to look for the course syllabi of the nine colleges.

The initial phone interviews and webpage searches revealed that each university had its own way of preparing their students for the use of technology in instruction. Some universities, such as Stanford University, did not have education programs for undergraduate students. Therefore, the preliminary research focused on four of the universities that offered a similar computer course: Arizona State University, Indiana University, Pennsylvania State University, and University of Virginia. The preliminary research examined how the course was taught and what was

instructed in the course. Phone call interviews were conducted to obtain detailed information on this specific course at each university, and the course webpages were downloaded for analysis.

Based on the findings of the preliminary study, the researcher expanded the study and collected data from a larger number of universities. First, the researcher collected data at two professional conventions: Association for Educational Communications and Technology (AECT) at St. Louis, Missouri in February 1998 and Society for Information Technology and Teacher Education (SITE) at Washington, DC in March 1998. Personal interviews were conducted in the conventions, and e-mail communication followed. Course syllabi were collected via e-mail and downloaded from the Internet.

Data was also collected from other universities that were convenient samples. They either had course syllabi on the Internet or were accessible by the researcher and her graduate students. No random sampling was involved in the selection. The data collection involved collecting syllabi via e-mail and the web, phone interviews, and personal interviews.

The study included a total of 30 universities: Appalachian State University, Arizona State University, Brigham Young University, California State University at San Bernardino, East Central University, Eastern Michigan University, Idaho University, Indiana University, Mankato State University, Michigan State University, Northwestern Oklahoma State University, Oklahoma City University, Oklahoma State University, Pennsylvania State University, San Diego State University, Southwestern Oklahoma State University, State University of New York, Texas Tech University, University of Alaska at Anchorage, University of California at San Diego, University of Central Florida, University of Central Oklahoma, University of Georgia at Athens, University of Houston, University of Iowa, University of Northern Iowa, University of Oklahoma, University of Southern Indiana, University of Virginia, and Valley City State University. Detailed course descriptions of 25 of the 30 universities were available. They were employed to construct the report in Table 1. URLs of some on-line course syllabi available during the research were no longer accessible when the paper was written. The references list URLs still active at the time of publication.

The data collection and analysis focused on structures and contents of the courses. Different course structures were recorded. Content topics like word processing and spreadsheet that were examined in the pilot study were employed for the research. Content topics were coded and categorized. During the analysis, other topics like video and traditional media emerged. The researcher and her graduate assistants recorded and analyzed the data using spreadsheet; they afterwards independently checked the data to ensure the accuracy.

Results and Discussions

The technology courses of the 25 universities were similar overall, but the details of the structure and content still varied from one university to another.

Structure

The technology course was a required course for students at most colleges of education, but not required for students at some colleges. Some faculty members thought that the course should be required while others did not. A faculty member at Appalachian State University discussed in an interview that no technology course was required in her college but starting 1999 there would be a "requirement for passing a technology competency test as one criterion for certification." She noted that it was a weakness having a competency test without offering a required technology course. A faculty member at Pennsylvania State University expressed different opinions. He mentioned that his college offered several computer courses to undergraduate education students and that "The Technology Course" could be a one-credit, two-credit, or three-credit course depending on the interest of the individual student. He thought that it was not necessary to require a specific course.

Should "The Technology Course" at the colleges of education be required? It depends on the philosophy of the faculty members and nature of the individual college. According to NCATE, teachers must have technology skills and knowledge. It is beneficial to offer a required course so that the students can systematically learn the skills and knowledge. Nevertheless, some students might have mastered the skills and knowledge before taking the course; they would get bored or impatient in class. It is suggested that a competence test be administered and that students be given a waiver for the course if they pass the test. For the colleges without such a required course, it is recommended that the colleges at least conduct a competence test to ensure quality of the graduates. Michigan State University sets an example. Students at this university are given the opportunity to choose a course or a competence test.

A competence test can easily evaluate students' computer skills and knowledge. Can it effectively assess students' abilities of integrating technology into classrooms? Is it beneficial to have a required course focusing on technology integration after students master the computer skills? Or is it possible to blend integration into the technology course? Faculty member J. Bauer at the University of Northern Colorado used "anchored approach" (Bauer, 1998) to blend integration into his educational technology course. The idea is promising. However, can students really learn a lot of information like word processing, spreadsheet, database, presentation, multimedia,

telecommunications, webpage development, and technology integration within one single course? It might be useful for students to take a technology integration course after the technology course. In the technology integration course, the instructor can focus on integration and at the same time review what students have learned in the technology course.

Two main types of teaching structures were found at the universities. The similarity of the two structures was that both structures consisted of lecture and lab. In the lecture, students learned computer concepts, and they conducted hands-on activities in the lab. The difference between the two structures resided in where the lecture was conducted. Arizona State University (ASU) and Indiana University (IU) were examples of the two structures.

At ASU, the lecture was conducted in a big lecture hall, which could accommodate numerous students. The concepts were taught there to approximately 100 students simultaneously. The hands-on activities were conducted at a computer lab in a small group, with approximately 25 students. Students had two different instructors, one for the lecture and one for the lab. The lecture syllabus corresponded to the lab syllabus. The course instructors used identical syllabi, assignments, mid-term, and final examinations. They also conducted weekly meetings to maintain consistency of the course.

At IU, the course was conducted in a computer lab where the instructors taught both computer concepts and skills. The course instructors were advised to teach similar content. However, they neither used identical syllabi nor conducted weekly meetings. They were free to design and construct their own lessons.

Both structures had their advantages and disadvantages. The structure at ASU was organized, and the course content was very consistent throughout different sections. This structure allowed the same content to be taught to more than 300 students each semester. In addition, this structure encouraged graduate students who were more likely able to catch up with updated computer skills to teach lab sections while faculty members provided expertise in concepts and theories during the lectures. The disadvantage of this structure was that the learning with numerous students in a big lecture hall might be less effective compared to the learning with only 25 students in a computer lab.

Unlike the structure at ASU, students at IU could access a computer at any time in class. They could also receive more attention from an instructor compared to students in a big lecture hall. The disadvantage of this structure was that students might not learn the same information from the same course. With enrollment of about 500 students per semester at IU and involvement of many instructors, one might wonder what students learned in the "same" course. An instructor of the course at the university addressed in a phone interview that the course content varied because each individual instructor emphasized different concepts and skills.

The structure at University of Georgia was similar to the one at IU. An instructor at University of Georgia said in an interview that some students learned video and webpage development in the course while the others did not. The instructors at both institutions did not seem concerned about consistency of the course.

Content

At all universities, the course content contained concepts and skills. Concepts included knowledge of computer technology, such as basics of hardware and telecommunication. Students were also expected to be able to demonstrate and master skills. For example, they should be able to type a paper using a word processor, record their students' grades using a spreadsheet, and keep the students' records using a database.

The table below (Tab. 1) reports topics that appeared in the courses at the 25 universities. The percentage indicates the ratio of the universities where the topics were taught. For example, telecommunication was taught at 21 out of the 25 universities; hence 84% was listed.

Some topics were clear and interpretative, such as word processing and spreadsheet. Other topics like telecommunication, computer issues, traditional media, and curriculum integration were comprised of subtopics. For example, telecommunication included Internet search, e-mail, and related topics; computer issues involved issues like copyright and security; traditional media consisted of lamination, paper-based bulletin board, and transparencies; curriculum integration covered lesson plan and activities integrating technology. If one of the subtopics was taught in the courses, the topic was marked. Therefore, it was possible that "telecommunication" was marked while "Internet search" was not taught in the course.

Table 1. Topics Included in the Courses and Percentage of the Universities That Taught the Topics

Topics	Percentage
Telecommunications	84%
Multimedia	80%
Spreadsheet	76%
Webpage development	72%
Word processing	68%
Presentation	60%
Software evaluation	60%
Database	56%
Curriculum integration	52%
Computer issues	48%
Hardware and software	44%
Video	24%
Desktop publishing	20%
Traditional media	8%

It was found that the courses were skill-based and usually started with basic tool applications. They consisted of word processor, spreadsheet, and database. Many universities used package software like ClarisWorks or MSWorks containing these three applications. Few universities employed Word, Excel, and FileMaker Pro. Students were expected to demonstrate efficient use of these three applications. There was a trend of the course away from word processing because students had previously mastered the skill.

Beyond the three tool applications, students were instructed in the use of multimedia and presentation software. Many colleges utilized HyperStudio for multimedia and PowerPoint for presentation. Telecommunication like Internet search and e-mail became important components, especially since more and more schools progressively have set up their networks. The advance of technology constantly causes the change of the course content; more and more colleges were including webpage development into the courses.

While many instructors were following steps of technology advancement and included webpage development and multimedia production into the courses, few instructors advocated the importance of teaching traditional media, such as lamination and transparency. Although in this study a low percentage (8%) of the colleges was found to teach traditional media, the instructors' rationale of teaching them was valid. They mentioned that technology in many public schools was very behind and that teachers needed to know how to use available technology, such as lamination and Apple II computers. Their statements pointed out a gap between technology preparation and technology use in real classrooms. The gap drew professionals' attention to the importance of the linkage or collaboration between university faculty members and schoolteachers.

University instructors should help students to effectively integrate technology into classrooms. NCATE has voiced the importance of technology integration (NCATE, 1997). Partnerships between colleges of education and local schools can help education students to understand technology need and use in real educational settings. The partnership among San Diego State University, O'Farrell Community School, and Morse High School sets a good example (San Diego State University, 1998). Dialogues between university faculty members and schoolteachers (superintendents and administrators) are essential.

Conclusions

Technology development is affecting our schools. Teacher education programs are required to prepare students to understand their new roles, use new approaches, and have new attitudes for teaching in the Information Age. "The Technology Course" is strongly suggested to be offered to students at each college of education. A competence test is recommended to be available for students with good computer background. Integration of technology into instruction is definitely needed for preparing professional teachers.

Two main structures are employed at the universities, and each structure has its own advantages and disadvantages. It is suggested that a college choose a structure, which fits its individual institution. The course content consists of computer concepts and skills. The primary components include word processing, spreadsheet, database, multimedia, presentation, telecommunications, and webpage development. With NCATE's directions, partnerships of colleges with local schools, and dialogue between university faculty members and schoolteachers, educators will provide students with skills of using technology and with abilities to integrate technology into curricula and instruction. Students with these skills and abilities will become qualified teachers who can prepare the children of the nation to face the challenges of the modern world.

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Acknowledgements

The author would like to express her sincere gratitude to all people who shared their syllabi and who contributed data. Special thanks to her graduate students who assisted in data collection and analysis.